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Sir:

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TIMOTHY O'BRIEN AND KENT D. PROSCH**For: **A METHOD AND SYSTEM FOR CONFIGURING A COMPUTER
NETWORK**

Enclosed are:

XXX Specification (21 pps); Claims (6pps); Abstract (1pp);**XXX** 4 sheets of drawings;**XXX** Declaration and Power of Attorney;**XXX** An assignment of the invention to: **International Business Machines Corporation** including \$40.00 recordation fee and Assignment Recordation Form Cover Sheet; Information Disclosure Statement (with copies of patent); Form - PTO-1449; Verified Statement Claiming Small Entity Status; and Priority of U.S. Patent Application Serial No. _____, filed on
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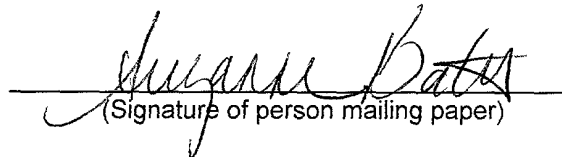


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A METHOD AND SYSTEM FOR CONFIGURING A COMPUTER NETWORK

FIELD OF THE INVENTION

5 The present invention relates to computer networks and, more particularly, to a method and system for configuring a computer network that includes devices with configurable full duplex bi-directional ports.

10 BACKGROUND OF THE INVENTION

 A computer network organized as a serial storage architecture (SSA) is a collection of nodes interconnected by a full duplex bi-directional serial
15 connection. A standard for SSA is set forth by the American National Standards Institute (ANSI) Task Group X3T10.1 in documents SSA-S2P, SSA-TL1 and SSA-PH1. Additional references are available from the SSA Industry Association in documents SSA-IA/95PH and SSA-IA95SP.

20

 In SSA, data is transferred between the nodes in data packets using a store and forward technique sometimes referred to as a bucket brigade. When the segments of an SSA network are organized in a loop, each
25 node is coupled to two other nodes and data can travel throughout the network in a full circle. Alternatively, the nodes can be connected in a string, that is, in a line, that terminates without being connected to a subsequent node. However, in either topology, data
30 communication throughout the network proceeds bi-directionally.

Each node has two ports, namely P1 and P2, and each port has an input and an output. Each port is further characterized by a state that can be defined as "on-line", "wrapped" or "off-line". In the on-line state
5 the port is able to bi-directionally communicate with a next port located on an adjacent node. In the wrapped state, the port is coupled to itself by having its output coupled to its input. In the off-line state, the port is not able to communicate with another port,
10 and it is not wrapped.

An SSA network is often referred to as a web. One web can be partitioned into several smaller webs, or separate webs can be combined to form one larger web.
15 Each web will have at least one initiator, which is a processor for routing data and commands to the nodes in the web. In the case where a web includes more than one initiator, the initiators are ranked from a highest priority to a lowest priority. Based on this priority,
20 the initiators will collectively designate one of the initiators as a master initiator.

A master initiator is responsible for handling error conditions that are reported to it by devices on its web.
25 The master initiator is also responsible for setting the state of the ports on its web.

An initiator acquires a view of the topology of the network through a process known as "walking the web."
30 When an initiator walks the web, the initiator examines the ports of the devices in the web of which the initiator is a member, and stores the state of the ports

in a topology table. The topology table describes the interconnection between nodes, i.e., the manner in which ports are linked together. It typically includes information such as a node identifier, and the state of
5 each port at the node. Each initiator maintains its own topology table.

Each initiator also maintains its own configuration table. A configuration table includes the same
10 information as a topology table, and further includes initiator registration information and port error handling parameters.

If a device on a web encounters a fault, the device
15 generates an error message, known as an "Async Alert" in SSA parlance. If the Async Alert indicates a port communications problem, the master initiator of the web responds by performing an automatic error recovery process in which it walks the web to examine and possibly
20 request a change of the state of the ports on the web. The master initiator may also issue a message known as a "Master Alert" to the non-master initiators. In response to a Master Alert, a non-master will walk the web and examine the ports on the web. However, a non-master
25 initiator does not request a change of the state of a port.

A master initiator can issue a request for a given port to assume the wrapped state. Provided that the
30 given port is operating normally, the given port will respond by wrapping itself.

Alternatively, a master initiator can issue a request for a given port to assume the on-line state. If the given port can establish communication with an adjacent port, then the given port assumes the on-line state. If the given port cannot establish communication with the adjacent port, then the given port assumes the off-line state. This failure to establish communication can occur when (a) there is no adjacent port, such as when the given port is at the end of a string, (b) the adjacent port is in the wrapped state, or (c) the communication link between the given port and the adjacent port has a problem. Note that the port may automatically transition from the on-line state to the off-line state depending on its ability to establish communication with the adjacent port.

When the network topology changes, initiator mastership can change, and a new master initiator will be responsible for the state of the ports. However, a first initiator cannot read a topology table from second initiator. Consequently, in a case where the first initiator becomes a master for a web of which the first initiator has no knowledge, the first initiator has no opportunity to preserve the state of a port located in that web.

Note also that the process of walking the web and requesting a particular state for a port is handled exclusively by the initiators. There is no method or means for imposing or even suggesting a desired configuration for the network.

Accordingly, it is an object of the present invention to impose a desired configuration on a computer network notwithstanding the presence of an initiator that can examine and request the ports in the network to
5 assume particular states.

It is another object of the present invention to impose the desired configuration in a case where the network includes multiple webs and multiple initiators.
10

It is yet another object of the present invention to maintain the desired configuration in a case where the topology of the network changes.

15

SUMMARY OF THE INVENTION

The present invention is directed toward a method and system for configuring a computer network that
20 includes full duplex bi-directional ports and one or more processors having an ability to examine and request that each port assume a particular state. The processor, also known as an initiator, maintains a copy of a port information map (PIM) that contains data
25 describing a desired state of all the ports in the network.

A control unit imposes a desired configuration by
30 (a) inhibiting all initiators from issuing requests for the ports to change state, (b) sending the PIM describing the desired configuration to the initiators,

and (c) enabling the initiators to issue requests for the ports to assume states in accordance with the PIM.

The present invention defines and imposes a desired configuration for the entire computer network and synchronizes the configuration among multiple initiators. When the topology of the network changes, the invention provides for the cases of partitioning the network into smaller networks, and for joining networks together. Because the invention affirmatively defines the state of all ports, when a master initiator walks the web, an isolated node remains isolated.

15 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic of a computer network organized in a serial storage architecture loop topology;

20 Fig. 2 is a flowchart of a method for imposing a desired configuring on a computer network in accordance with the present invention;

25 Fig. 3 is a flowchart of a method for an initiator to set the state of a port in a network in accordance with data describing a desired state for the port; and

Fig. 4 is a flowchart of a method for an initiator to walk the web and construct a topology table.

30

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a method for configuring a computer network that includes devices with
5 full duplex bi-directional ports and an initiator having an ability to examine and request each port to assume a particular state in accordance with data describing a desired configuration. Each port can assume an on-line, off-line or wrapped state.

10

In brief, a control unit constructs a port information map (PIM) that defines a desired state for each port in the entire computer network. The control unit issues the PIM to the initiator. When the initiator
15 configures the web, it requests the ports to assume desired states in accordance with the PIM. In a case of multiple webs and multiple initiators, the PIM provides all initiators with the desired state of all ports in the network. Therefore a given initiator has knowledge of
20 the desired state of all ports, including those that are not in the same web as the given initiator. This allows an initiator to manage the ports in a case where the network topology changes.

25 Fig. 1 is a schematic representation of a computer network 1 organized in a serial storage architecture loop topology. The principal components of the network are a host processor 5 with a user interface 3, a control unit
10, initiators 15 - 17, and a series of nodes occupied by
30 disk drives 50 - 67. In a general case, any type of device that can be connected to a computer network,

including typical input/output devices can occupy the nodes.

User interface 3 enables a user to send commands and
5 data to, and receive data from, computer network 1. Host
processor 5 communicates with control unit 10 over a bus
6, and control unit 10 communicates with initiators 15 -
17 via a bus 12. Initiators 15 - 17 and disk drives 50 -
67 are connected to a network comprising three segments
10 20, 21 and 22. Each of the initiators 15 - 17 and disk
drives 50 - 67 include two full duplex bi-directional
ports, i.e. P1 and P2, through which data is exchanged.
Generally, a device need not be limited to two ports, and
the present invention can be applied where the devices
15 have any number of ports.

Host processor 5 executes programs using data that
is stored on disk drives 50 - 67. To access data from a
disk drive, disk drive 50 for example, host processor 5
20 issues a command to control unit 10. Thereafter, control
unit 10 issues a corresponding command to initiator 15,
which passes the command to disk drive 50. The commands
from the initiators 15 - 17 to the disk drives 50 - 67
provide for reading data from, and writing data to, disk
25 drives 50 - 67, and for setting the state of ports on
each of disk drives 50 - 67.

Control unit 10 includes a processor 10a and memory
10b that can be loaded with a program or data from a
30 storage media, such as data memory 8. When control unit
10 issues a command to any initiator 15 - 17, the
initiator acknowledges the command by returning a status

packet indicating whether the initiator successfully completed the command. Although control unit 10 and initiators 15 - 17 are shown here as separate components, they may be integrated into a single housing, or even a
5 single printed circuit board.

One of the initiators 15 - 17 must be designated as a master initiator. This designation of mastership occurs during the web walking process. Each of the
10 initiators 15 - 17 has an identifier that also prioritizes the initiators. When a first initiator walks the web and encounters a second initiator, the first initiator reads the identifier of the second initiator. If the identifier of the first initiator indicates a higher
15 priority, then the first initiator assumes mastership. If the identifier of the second initiator indicates a higher priority, then the first initiator concedes mastership. For the description that follows, assume that the initiators are prioritized as 15, 16 and 17,
20 with initiator 15 having the highest priority.

Computer network 1 can be organized into segments of smaller webs. For example, assume that devices 53 and 65 are isolated from the network. This would yield (a) a
25 first web, configured as a string that included initiators 15 and 16, and devices 50 - 52 and 56 - 64, and (b) a second web, configured as a string that included initiator 17, and devices 54, 55, 66 and 67. Initiator 15 would assume mastership of the first web,
30 and initiator 17 would assume mastership of the second web.

A sample Port Information Map is set forth in Table 1, below. Referring again to Fig. 1, assume devices 53 and 65 are isolated. Note that in Table 1, device 53-P1 and -P2 are both indicated as "(undefined)", device 52-P1 is "wrapped", and device 54-P2 is "wrapped". Also, device 65-P1 and -P2 are both indicated as "(undefined)", device 64-P2 is "wrapped", and device 66-P1 is "wrapped".

TABLE 1
PORT INFORMATION MAP
DEVICES 53 AND 65 ISOLATED

| NODE | PORT | STATE |
|--------------|------|-------------|
| Initiator 15 | P1 | On-line |
| Initiator 15 | P2 | On-line |
| Initiator 16 | P1 | On-line |
| Initiator 16 | P2 | On-line |
| Initiator 17 | P1 | On-line |
| Initiator 17 | P2 | On-line |
| Device 50 | P1 | On-line |
| Device 50 | P2 | On-line |
| Device 51 | P1 | On-line |
| Device 51 | P2 | On-line |
| Device 52 | P1 | Wrapped |
| Device 52 | P2 | On-line |
| Device 53 | P1 | (undefined) |
| Device 53 | P2 | (undefined) |
| Device 54 | P1 | On-line |
| Device 54 | P2 | Wrapped |
| Device 55 | P1 | On-line |
| Device 55 | P2 | On-line |
| Device 56 | P1 | On-line |
| Device 56 | P2 | On-line |
| Device 57 | P1 | On-line |
| Device 57 | P2 | On-line |
| Device 58 | P1 | On-line |
| Device 58 | P2 | On-line |
| Device 59 | P1 | On-line |
| Device 59 | P2 | On-line |
| Device 60 | P1 | On-line |
| Device 60 | P2 | On-line |
| Device 61 | P1 | On-line |
| Device 61 | P2 | On-line |
| Device 62 | P1 | On-line |
| Device 62 | P2 | On-line |
| Device 63 | P1 | On-line |

| NODE | PORT | STATE |
|-----------|------|-------------|
| Device 63 | P2 | On-line |
| Device 64 | P1 | On-line |
| Device 64 | P2 | Wrapped |
| Device 65 | P1 | (undefined) |
| Device 65 | P2 | (undefined) |
| Device 66 | P1 | Wrapped |
| Device 66 | P2 | On-line |
| Device 67 | P1 | On-line |
| Device 67 | P2 | On-line |

During the new configuration process, control unit
 10 issues commands to the initiators 15 - 17. The
 commands include a Freeze Command, Query Configuration
 5 Command, Execute Port Information Map (XPIM) Command,
 Unfreeze Command, and Validate Configuration Command.

The Freeze Command inhibits all initiators from
 responding to an Async Alert by performing an automatic
 10 error recovery process. That is, the initiators are
 inhibited from issuing requests to change the states of
 the ports when responding to the Async Alert. Note that
 during regular operation, an initiator may respond to the
 Async Alert by performing an automatic error recovery
 15 process that alters the state of one or more ports.

The Query Configuration Command causes an initiator
 to send data from its Configuration Table to the control
 unit. After obtaining a Configuration Table from each of
 20 the initiators in the network, the control unit can
 consider the current actual configuration, and develop a
 desired configuration, for the entire network.

When issuing the Execute Port Information Map (XPIM)
 25 Command, the control unit also sends the PIM to an
 initiator. The XPIM causes the initiator to walk the web.

If the initiator is a master initiator, it is thus enabled to issue requests for the ports in its web to assume states in accordance with the PIM.

5 The Unfreeze Command enables the initiators to respond to an Async Alert by performing an automatic error recovery process. That is, the initiators are not inhibited from issuing requests to change the states of ports when responding to the Async Alert.

10

The Validate Configuration Command causes an initiator to walk the web and to compare the actual port settings to data in the PIM. The initiator reports the result of this comparison to the control unit.

15

Fig. 2 is a flowchart of a method for imposing a desired configuration on a computer network in accordance with the present invention. This method is applicable to a network having a single initiator, as well as a network
20 having multiple webs and multiple initiators.

In step 205, the control unit (CU) suspends all drive commands by allowing existing drive commands to be completed, and by not issuing new commands. More
25 particularly, the control unit waits for each initiator to acknowledge completion of all commands previously issued by the control unit. The method then advances to step 210.

30 In step 210, the control unit issues a Freeze Configuration Command to all initiators. All initiators are inhibited from issuing requests to change the states

of the ports when responding to an Async Alert. This step ensures that the occurrence of an Async Alert does not interfere with the present process. The method then advances to step 215.

5

In step 215, the control unit determines whether to attempt to establish a new network configuration. This determination allows for a case where, after a predetermined number of attempts, the control unit has not been able to successfully establish communication with all of the initiators. If the control unit determines that it will not attempt to establish a new network configuration, then the method branches to step 275 and terminates. If the control unit determines that it will attempt to establish a new network configuration, then the method advances to step 220.

In step 220, the control unit issues a Query Configuration Command to each initiator. In response to the Query Configuration Command, an initiator sends data from its Configuration Table to the control unit. The method then advances to step 225.

In step 225, the control unit establishes a desired configuration for the network, based on the actual configuration reported by each of the initiators in step 220. The control unit constructs a Port Information Map (PIM) describing the desired configuration for the entire network. The PIM includes a desired setting for all ports in the network. The method then advances to step 230.

As an alternative to steps 220 and 225, a user of computer network 1 can define a desired configuration via user interface 3. Accordingly, the PIM would be based on input from the user.

5

In step 230, the control unit issues an Execute Port Information Map (XPIM) Command to each of the initiators in the network. The control unit sends the command to each initiator in a determined sequence. The sequence
10 starts with the highest-ranking initiator (rank 0) and progresses in order of priority to the lowest-ranking initiator (rank n). With each XPIM Command the control unit also sends the PIM to the initiator describing a desired state of the ports. In response to receiving
15 the XPIM command, the initiator walks the web and constructs a topology table and a configuration table. If the initiator is a master initiator, it may also issue requests for the port states to be set in accordance with the PIM. The XPIM process as executed by an initiator is
20 illustrated in Fig. 3 and described below in greater detail. The method then advances to step 235.

By affirmatively defining a desired state for each port in the network, a network can be partitioned into
25 smaller webs, or similarly, webs can be merged into a larger network. Stated more generally, the method can be applied where a network has M number of webs, each of the M number of webs including a respective initiator and a respective full duplex bi-directional port.
30 After the initiators issue the requests for setting the ports to the desired states, the computer network can have N number of webs, where N is not equal to M.

In step 235, the control unit determines whether all initiators successfully executed the XPIM Commands that were issued in step 230. An initiator acknowledges a
5 command from the control unit by returning a status packet indicating whether the initiator successfully completed the command. If all initiators successfully executed their respective XPIM Command, then the method advances to step 250. If all initiators did not
10 successfully executed their respective XPIM Command, then the method advances to step 240.

In step 240, the control unit issues another XPIM Command to each of the initiators. As before, this is
15 done in sequence starting with the highest-ranking initiator and progressing in order of priority to the lowest-ranking initiator. Each respective initiator executes the process illustrated in Fig. 3. The method then advances to step 245.

20 In step 245, the control unit determines whether all initiators successfully executed the XPIM Commands that were issued in step 240. If all initiators successfully executed their respective XPIM Command, then the method
25 advances to step 250. If all initiators did not successfully executed their respective XPIM Command, then the method loops back to step 215.

In step 250, the control unit issues an Unfreeze
30 Command to all initiators. The master initiators are thus permitted to request changes in the state of the

ports when responding to Async Alerts. The method then advances to step 255.

5 In step 255, the control unit issues a Validate Configuration Command to each of the initiators. In response, each initiator compares the actual configuration to data in the PIM. The initiators report the result of these comparisons to the control unit. The method then advances to step 260.

10

In step 260, the control unit determines whether the current configuration of the network conforms to the desired configuration of the network. More particularly, the control unit evaluates the reports sent by the
15 initiators in step 255. If the reports from all initiators indicate that the current configuration matches the PIM, then the method advances to step 265. If the reports from all initiators do not indicate that the current configuration matches the PIM, then the
20 method loops back to step 210.

In step 265, the control unit resumes regular operation by issuing disk drive commands to the initiators. The method then advances to step 270.
25

In step 270, the method terminates with a successful reconfiguration of the network.

In step 275, the method terminates with a failure.
30 The control unit did not successfully establish the desired network configuration.

Fig. 3 is a flowchart a method executed by an initiator, in response to receiving the Execute Port Information Map (XPIM) command from the control unit. The method begins with step 310.

5

In step 310, the initiator walks the web and constructs a topology table. This process is illustrated in Fig. 4, and described below in greater detail. The method then advances to step 315.

10

In step 315, the method considers whether the initiator is a master initiator. This is accomplished by examining the current topology table that was constructed in step 310. If the initiator is a master, then the method advances to step 320. If the initiator is not a master, then the method branches to step 335.

In step 320, the initiator issues a request for each port in the initiator's web to assume the on-line state. This step ensures that the initiator can communicate with all ports in its web. That is, the initiator can affirmatively access ports that might otherwise be inaccessible because of a previously wrapped port at an intermediate node. The method then advances to step 325.

25

In step 325, for each port in the initiator's web, the initiator issues a request for the port to assume a desired state in accordance with data in the PIM. The method then advances to step 330.

30

In step 330, the initiator walks the web and constructs a topology table as shown in Fig. 4. The method then advances to step 335.

5 In step 335, the initiator constructs a configuration table. The configuration table is first built on the information contained in the topology table. To this topology information, the initiator adds information important to the operation and error handling
10 of the network. This added information includes:

- (a) more detailed port setting information derived from the complete web topology;
- 15 (b) Async Alert address information used by all the ports and associated master initiator during error handling; and
- (c) identification and access information used for data access between initiators and drives.

20 The method then advances to step 340.

In step 340, the method considers whether the initiator is a master initiator. This is accomplished by examining the most current topology table constructed in
25 steps 310 or 330. Note that a previous master initiator may have lost web mastership as a result of steps 320 and 325. If the initiator is a master, then the method advances to step 345. If the initiator is not a master, then the method branches to step 350.

30

In step 345, for each port in the initiator's web the initiator issues a request for the port to assume a

final state in accordance with the configuration table.
The port's final state includes not only a setting in
accordance with data in the PIM, but also settings
important to the operation and error handling of the
5 network. The method then advances to step 350.

In step 350, the initiator compares the actual
configuration of the web, as represented in the
initiator's configuration table, to the PIM. If the
10 configurations match, then the method advances to step
355. If the configurations do not match, then the method
advances to step 360.

In step 355, the XPIM is declared as a success. The
15 method then advances to step 365.

In step 360, the XPIM is declared unsuccessful. The
method then advances to step 365.

20 In step 365, the XPIM method ends.

Fig. 4 is a flowchart of a method for an initiator
to walk the web and construct a topology table.
Initially, the topology table is empty. The method
25 begins with step 410.

In step 410, the method considers whether the
initiator has explored all nodes in the web in which
the initiator is located. All nodes are explored when
30 (a) the initiator encounters a given node for a second
time, thus indicating that the initiator has explored
an entire a loop, or (b) the initiator has explored all

nodes that are accessible via all of the initiators' ports. If the initiator has explored all nodes, then the method branches to step 430. If the initiator has not yet explored all nodes, then the method advances to
5 step 415.

In step 415, the initiator attempts to establish communication with a next node. The method then advances to step 420.
10

In step 420, the method determines whether the attempt to establish communication in step 415 was successful. For example, if the initiator has progressed to the end of a string, then there is no
15 next node and the attempted communication will not be successful. If the attempt to establish communication was not successful, then the method loops back to step 410. If the attempt to establish communication was successful, then the method advances to step 425.

In step 425, the initiator updates its topology table. That is, the initiator adds an entry to the topology table to represent the node. The method then loops back to step 410.
20

In step 430, the method for walking the web ends.
25

The present invention for configuring a computer network can also be applied in the following
30 circumstances: configuring an SSA web during a power-on sequence, configuring an SSA web during drive replacement or initiator replacement, configuring an SSA web during

drive capacity upgrades, fencing a drive, and fencing an
SSA initiator. However, the present invention is not
limited to SSA, but can be used for any computer network
having devices with full duplex bi-directional ports that
5 can be set to an on-line or wrapped state.

It should be understood that the foregoing
description is only illustrative of the invention.
Various alternatives and modifications can be devised by
10 those skilled in the art without departing from the
invention. Further, while the procedures required to
execute the invention hereof are indicated as already
loaded into the memory of the control unit and
initiators, they may be configured on a storage media,
15 such as data memory 8 in Fig. 1, for subsequent loading
into the control unit and initiators. Accordingly, the
present invention is intended to embrace all such
alternatives, modifications and variances that fall
within the scope of the appended claims.

20

CLAIMS

What is claimed is:

1. A method for configuring a computer network that includes a full duplex bi-directional first port and an initiator that can issue a request for said first port to assume a state,

wherein said first port, when in a first state, is able to bi-directionally communicate with a full duplex bi-directional second port,

wherein said first port, when in a second state, is coupled to itself by having an output thereof coupled to an input thereof,

said method comprising:

inhibiting said initiator from issuing said request,

sending data to said initiator describing a desired state of said first port, and

enabling said initiator to issue said request for said first port to assume said desired state.

2. The method of claim 1, further comprising after said inhibiting step, the step of receiving data from said initiator describing an actual state of said first port.

3. The method of claim 2, further comprising after said receiving step, the step of determining said desired state based on said actual state.
4. The method of claim 1, wherein said computer network includes a plurality of webs, and each of said plurality of webs includes a respective initiator and a respective full duplex bi-directional port.
5. The method of claim 1, wherein prior to said inhibiting step said computer network has M number of webs, and each of said M number of webs includes a respective initiator and a respective full duplex bi-directional port, and after said enabling step said computer network has N number of webs, where N is not equal to M.
6. The method of claim 1, wherein said initiator is one of a plurality of initiators, and wherein said inhibiting step comprises inhibiting said plurality of initiators from issuing said request, and wherein said enabling step comprises enabling said plurality of initiators in a determined sequence.
7. The method of claim 1, wherein said desired state is specified by a user.
8. The method of claim 1, wherein said computer network conforms to American National Standards Institute (ANSI) Standard X3T10.1.

9. A controller for configuring a computer network that includes a full duplex bi-directional first port and an initiator that can issue a request for said first port to assume a state,

wherein said first port, when in a first state, is able to bi-directionally communicate with a full duplex bi-directional second port,

wherein said first port, when in a second state, is coupled to itself by having an output thereof coupled to an input thereof,

said controller comprising:

means for inhibiting said initiator from issuing said request,

means for sending data to said initiator describing a desired state of said first port, and

means for enabling said initiator to issue said request for said first port to assume said desired state.

10. The controller of claim 9, further comprising means for receiving data from said initiator describing an actual state of said first port.

11. The controller of claim 10, further comprising means for determining said desired state based on said actual state.

12. The controller of claim 9, wherein said computer network includes a plurality of webs, and each of said plurality of webs includes a respective initiator and a respective full duplex bi-directional port.

13. The controller of claim 9, wherein said computer network has M number of webs, and each of said M number of webs includes a respective initiator and a respective full duplex bi-directional port, and said controller configures said computer network to yield N number of webs, where N is not equal to M.

14. The controller of claim 9, wherein said initiator is one of a plurality of initiators, and wherein said inhibiting means inhibits said plurality of initiators from issuing said request, and wherein said enabling means enables said plurality of initiators in a determined sequence.

15. A storage media including instructions for controlling a processor that, in turn, configures a computer network that includes a full duplex bi-directional first port and an initiator that can issue a request for said first port to assume a state,

wherein said first port, when in a first state, is able to bi-directionally communicate with a full duplex bi-directional second port,

wherein said first port, when in a second state, is coupled to itself by having an output thereof coupled to an input thereof,

said storage media comprising:

means for controlling said processor to inhibit said initiator from issuing said request,

means for controlling said processor to send data to said initiator describing a desired state of said first port, and

means for controlling said processor to enable said initiator to issue said request for said first port to assume said desired state.

16. The storage media of claim 15, further comprising means for controlling said processor to receive data from said initiator describing an actual state of said first port.

17. The storage media of claim 16, further comprising means for controlling said processor to determine said desired state based on said actual state.

18. The storage media of claim 15, wherein said computer network includes a plurality of webs, and each of said plurality of webs includes a respective initiator and a respective full duplex bi-directional port.

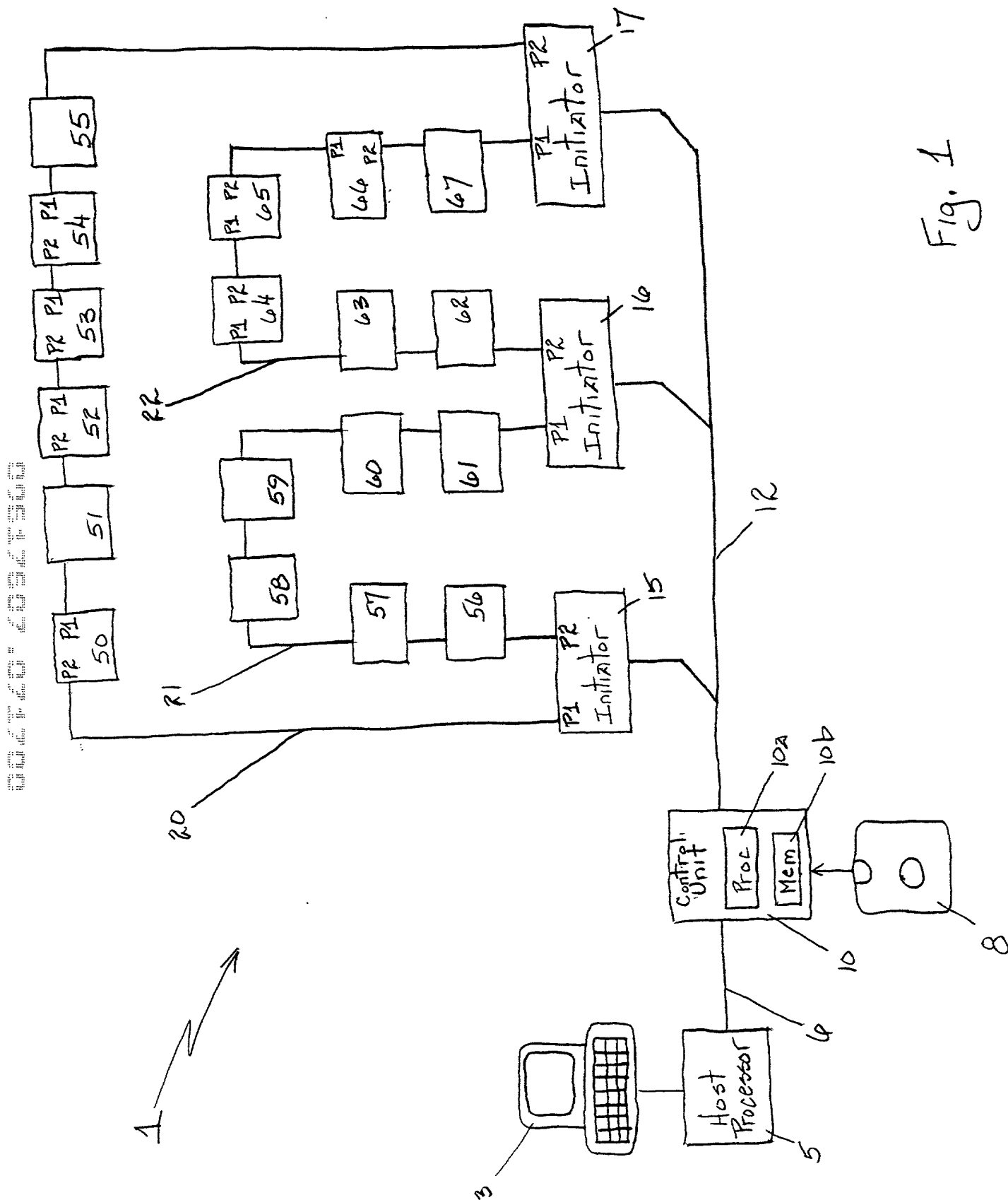
19. The storage media of claim 1, wherein said computer network has M number of webs, and each of said M number of webs includes a respective initiator and a

respective full duplex bi-directional port, and said processor configures said computer network to yield N number of webs, where N is not equal to M.

20. The storage media of claim 15, wherein said initiator is one of a plurality of initiators, and wherein said storage media comprises means for controlling said processor to inhibit said plurality of initiators from issuing said request, and means for controlling said processor to enable said plurality of initiators in a determined sequence.

ABSTRACT

A method for configuring a computer network that includes a full duplex bi-directional first port and an initiator that can issue a request for the first port to assume a state. The first port, when in a first state, is able to bi-directionally communicate with a full duplex bi-directional second port, and when in a second state, is coupled to itself by having an output thereof coupled to an input thereof. The method comprises inhibiting the initiator from issuing the request, sending data to the initiator describing a desired state of the first port, and enabling the initiator to issue the request for the first port to assume the desired state.



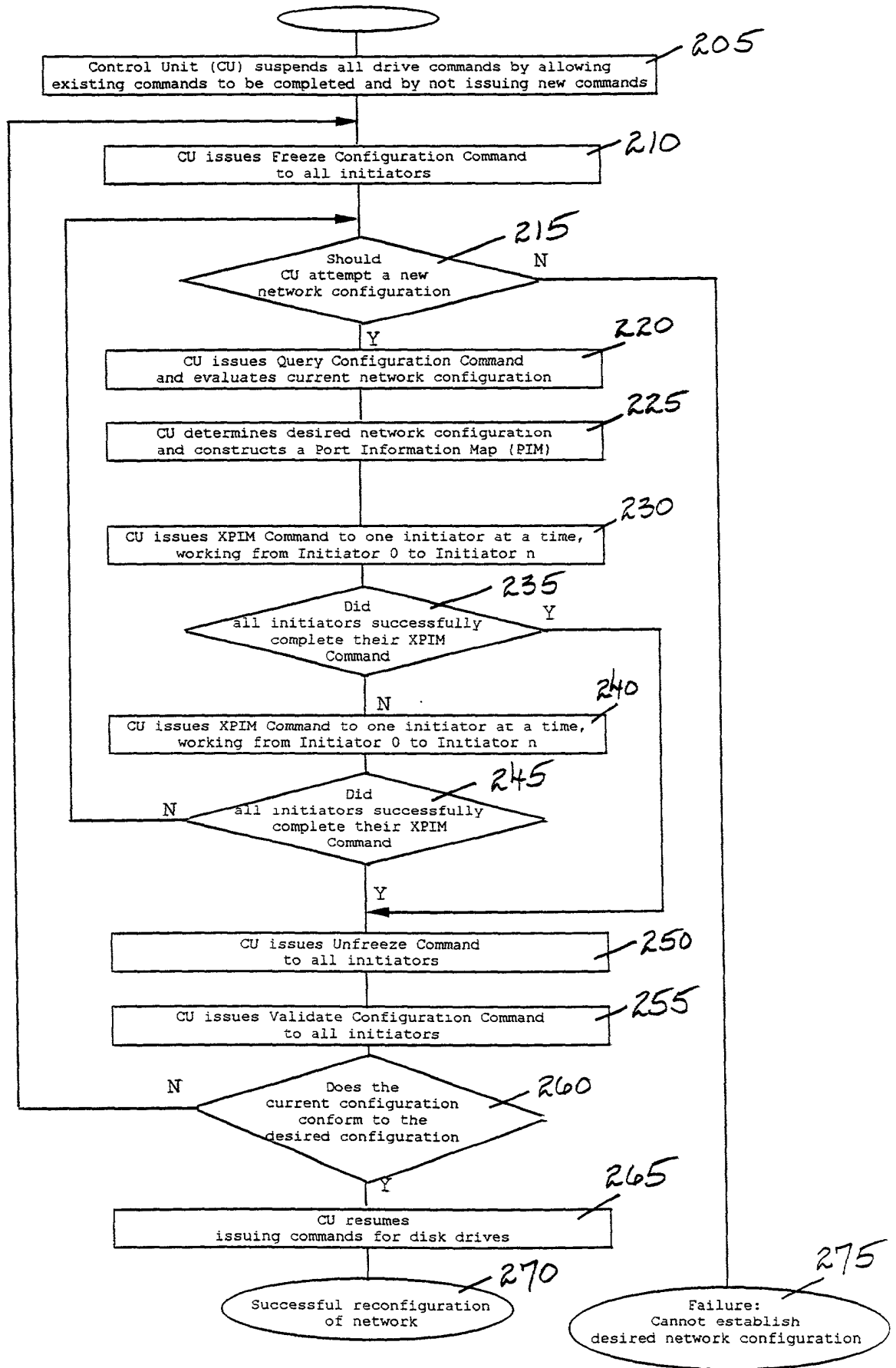


Fig. 2

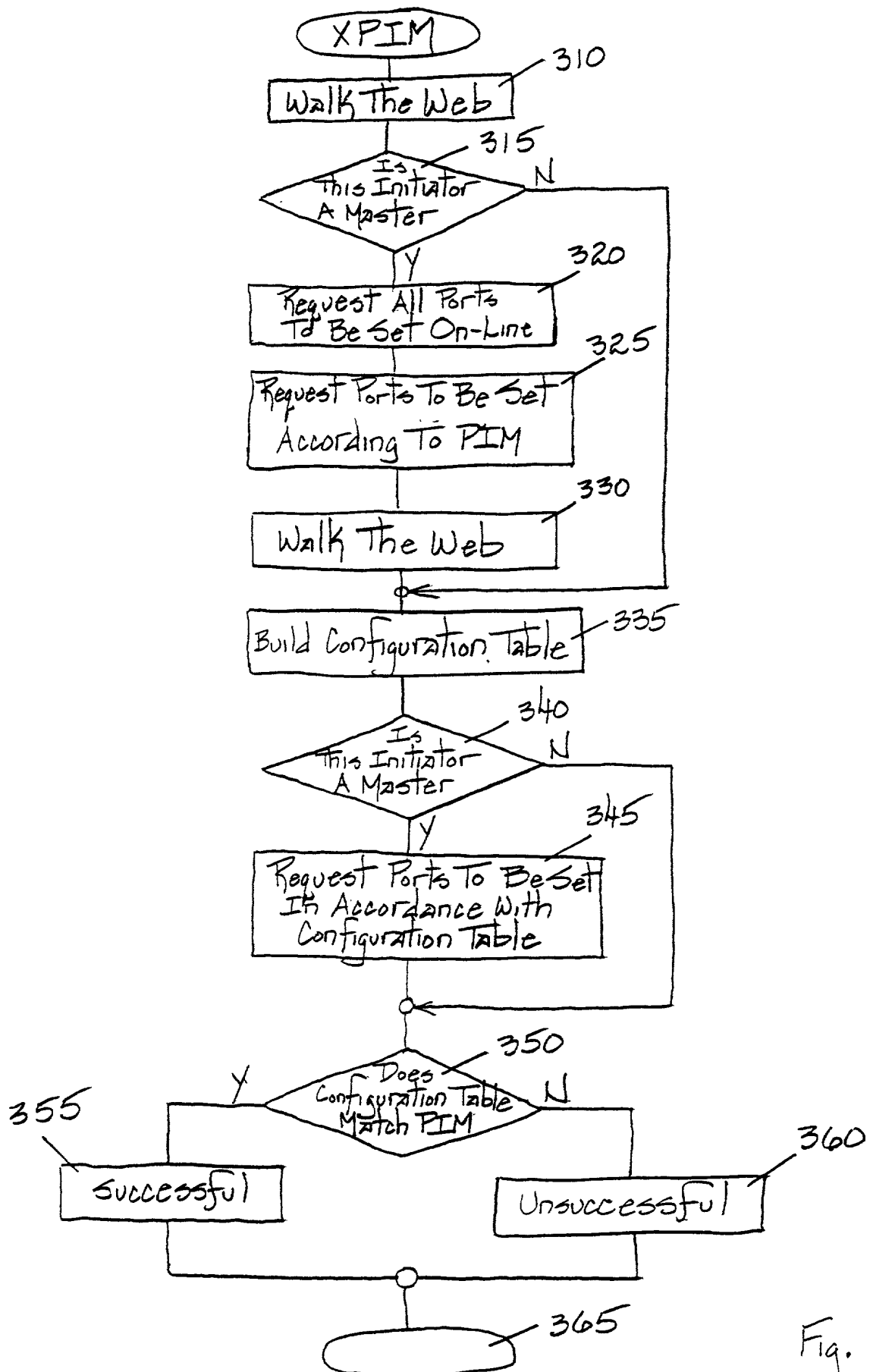


Fig. 3

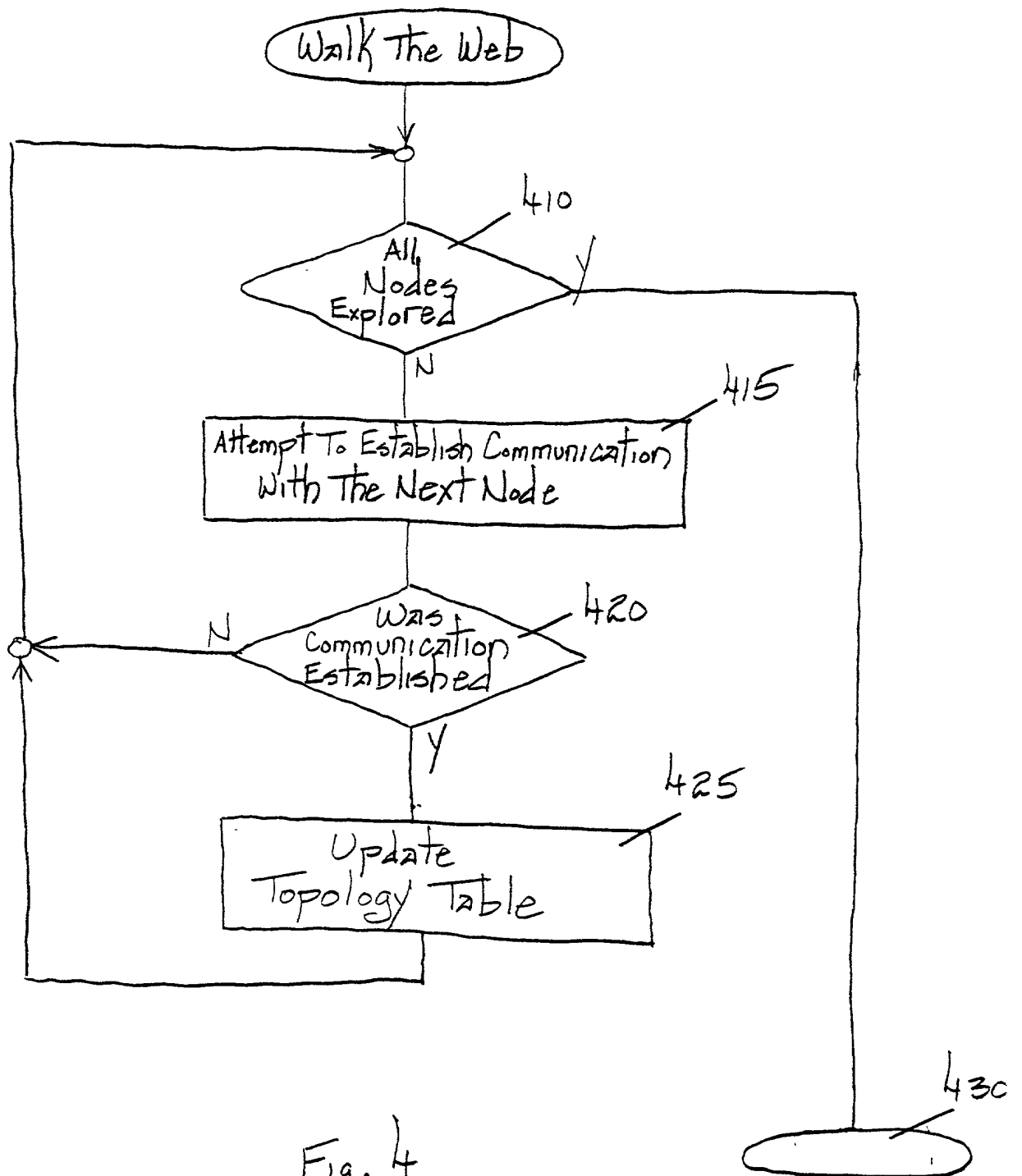


Fig. 4

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Full name of seventh joint-inventor: KENT D. PROSCH

Inventor's signature:

Date:

Kent D. Prosch

6/5/00

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Inventor's signature:

Date:

Kevin Kidney 5-30-2000

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Nelson W. Gildenmeister

June 20, 2000

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Citizenship: USA

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Full name of fourth joint-inventor: JOHN HOUKAL

Inventor's signature:

Date: 5/25/00

Residence: 1444 Fillmore Place, Louisville, CO 80027

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Full name of fifth joint-inventor: KEVIN KIDNEY

Inventor's signature:

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Residence: 321 Bobcat Point, Lafayette, CO 80026

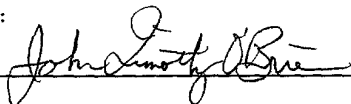
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Full name of sixth joint-inventor: JOHN TIMOTHY O'BRIEN

Inventor's signature:

Date:



22 May 2000

Residence: 538 West Spruce Way, Louisville, CO 80027

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Full name of seventh joint-inventor: KENT D. PROSCH

Inventor's signature:

Date:

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As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

A METHOD AND SYSTEM FOR CONFIGURING A COMPUTER NETWORK

the specification of which (check one)

☒ X is attached hereto.
☐ was filed on _____
as Application Serial No. _____
and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed:

| Prior Foreign Application(s) | Priority Claimed |
|------------------------------|----------------------------------|
| <u>None</u> (Number) | <u>_____</u> Yes <u>_____</u> No |
| (Country) | (Day/Month/Year Filed) |

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56, which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

| <u>None</u> (Application Serial No.) | (Filing Date) | (Status) (patented, pending, abandoned) |
|---|---------------|---|
|---|---------------|---|

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

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